UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
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DATE: **See E-Signature Block Below**

SUBJ: Pike Hill Copper Mine - Approval to perform an Engineering Evaluation/Cost Analysis for a Non-Time-Critical Removal Action

FROM: Edward Hathaway, Remedial Project Manager
ME/VT/CT Superfund Section

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TO: Karen McGuire, Director
Enforcement and Compliance Assistance Division
for Bryan Olson, Director, Superfund and Emergency Management Division
EPA Region 1

I. Subject

The purpose of this memorandum is to request and document your approval to authorize the expenditure of federal funds to conduct an Engineering Evaluation/Cost Analysis (EE/CA) for a Non-Time-Critical Removal Action (NTCRA) at the Pike Hill Copper Mine Superfund Site (Site) in Corinth, Vermont. Based on investigations conducted by the United States Environmental Protection Agency (EPA) and the Vermont Department of Environmental Conservation (VTDEC), the Agency has determined that there has been and continues to be a release into the environment of a hazardous substance which may present an imminent and substantial danger to public health or welfare. The proposed NTCRA will reduce ecological impacts to Pike Hill Brook and a tributary of Cookville Brook by preventing the release of mining influenced water (MIW) from mine waste (waste rock and tailings) and adits and preventing the migration of mine waste from the Site. Surface water impacts include acute toxicity for aquatic biota and depletion of prey organisms that sustain federal, and state threatened and endangered bats.

The Fund-lead remedial investigation/feasibility study (RI/FS) for the Site is ongoing. The proposed NTCRA will allow EPA to address more quickly the main source of the MIW that is impacting the surface water, sediment, and downstream wetland areas while the full nature and extent of contamination associated with the Site is defined. The decision to proceed with an EE/CA to support the NTCRA is consistent with the long-term Site remedial strategy to minimize both exposures to, and migration of, contaminants (e.g., aluminum, copper, iron and zinc) associated with mine waste and MIW, and the associated environmental impacts to Pike Hill Brook and a tributary of Cookville Brook. The mine waste is also a source of groundwater contamination, and drainage from the mine pool within the Underground Workings through the adits is a source of surface water contamination.

Because the NTCRA may require funding in excess of $6 million, EPA New England Region has consulted with EPA Headquarters prior to authorizing this Approval Memorandum.

II. Background

A. Site Description and History

City and State: Corinth, VT
County: Orange
EPA ID: VTD988366720
Final NPL Listing: Federal Register / Vol. 69, No. 140 / Thursday, July 22, 2004
Latitude: 44° 03' 26.4" N Longitude: 72° 18' 24.9" W

The Pike Hill Copper Mine Superfund Site is an abandoned copper mine located in the Town of Corinth, Orange County, Vermont. It includes the Union, Eureka (also known as Corinth), and Smith (also known as Bicknell) mines. The entire Site encompasses about 216 acres and contains approximately 50,000-100,000 tons of waste rock and tailings that are acting as a continuing source of contamination for the surface water of Pike Hill Brook, a tributary to Cookville Brook, and the groundwater. The mine waste generates a low pH leachate with elevated metals, particularly aluminum, copper, iron and zinc. Together, the Pike Hill Mines are the most northerly of the copper mines comprising the larger Orange County Copper District. The other mines in the district include the Elizabeth Mine and the Ely Mine are both also NPL Superfund sites, Elizabeth Mine Superfund Site and Ely Copper Mine Superfund Site in Strafford/Thetford and Vershire, Vermont, respectively. The Orange County Copper District is approximately 25 miles long and 5 miles wide.

Copper ore was initially discovered in the vicinity of the Smith Mine on Pike Hill in 1845. In about 1853, mining of the Eureka deposit began at the peak of Pike Hill. Underground operations at the Eureka and Union Mines began in 1863. In 1881, the known portion of the ore body at the Union Mine was exhausted. The Smith Mine closed in 1882, leaving a relatively small area of waste rock piles and underground workings. The Eureka Mine ore mill closed in 1907 and

activities are poorly documented between 1907 and 1915, suggesting limited mining took place there. Operations at the Eureka and Union Mines resumed under a single company (Pike Hill Mines Company) between 1916 and 1919, when approximately 842,000 pounds of copper were produced using flotation processes with pine oil as an additive. The underground workings were never reopened, but during the late 1940s and early 1950s, portions of the ore dumps were trucked to the Elizabeth Mine mill for processing. The only remaining Site buildings were destroyed by fire in 1960.

In 1954, the Site property was sold by Vermont Copper Company to Appalachian Sulphides, Inc., which subsequently sold the property to Pat Mines, Inc., in 1962. All three of these companies are now defunct.

Currently, there are two owners of the Site property. One parcel, including the Union and Eureka Mines and is now owned by Second Growth Holdings, LLC, which acquired the property from LBI Timber LLC (LBI Timber) in approximately 2012. The location of the Smith Mine is owned by a private entity which has owned this parcel since 1983.

The remedial investigation, to date, has included a number of studies to define the nature and extent of contamination at the site. EPA, through an inter-agency agreement with the United States Geological Survey (USGS) performed a series of investigations from 2004 through 2007. These investigations included surface-water sampling and flow measurements, sediment sampling, mine-waste characterization, benthic community and fish community studies, and surface water toxicity testing. EPA has also completed a baseline historic resource characterization and topographic surveys for the Pike Hill Copper Mine. EPA sampled surface water and mine waste in 2021 to confirm that site conditions had not changed during the time interval from 2007 until 2021. The following documents have been completed to date for the Pike Hill Copper Mine.

- Draft Remedial Investigation Field Investigation Plan, Pike Hill Copper Mine Superfund Site Operable Unit 01, Corinth, Vermont. July.
- Failure Modes and Effects Analysis at Pike Hill Copper Mines Superfund Site. August.
- Aquatic Assessment of the Pike Hill Copper Mine Superfund Site, Corinth, Vermont. USGS Scientific Investigations Report 2012-5288.
- Final Report, Historic/Archaeological Mapping and Testing, Pike Hill Mines Site. February 2011.
- Draft Conceptual Site Model Technical Memorandum. Pike Hill Copper Mine Site, Corinth, Vermont. June.
- Surface-Water Hydrology and Quality at the Pike Hill Superfund Site, Corinth, Vermont, October 2004 to December 2005. USGS Scientific Investigations Report 2007- 5003.

- Geochemical Characterization of Mine Waste, Mine Drainage, and Stream Sediments at the Pike Hill Copper Mine Superfund Site, Orange County, Vermont. USGS Scientific Investigations Report 2006-5303.
- Sequential Extraction Results and Mineralogy of Mine Wastes and Stream Sediments Associated with Metal Mines in Vermont, Maine and New Zealand. USGS Open-File Report 07-1063.
- Surface-Water Hydrology and Quality at the Pike Hill Superfund Site, Corinth, Vermont.

B. Nature and Extent of Contamination

The primary source of impacts to surface water at the Site is derived from the interaction of water from snow melt, rain, and groundwater percolating through the piles of waste rock and tailings which subsequently transports low pH, metal-laden water and sediment downgradient into Pike Hill Brook and the tributary to Cookville Brook. Pike Hill Brook extends approximately 4.3 miles from the Site to the confluence with the Waits River. There are two distinct source areas at the Pike Hill Mine Superfund Site. One area related to the Eureka and Union mines is located along northeast slope of Pike Hill. The discharge from the associated waste piles impact Pike Hill Brook. The Smith Mine is in a separate drainage on the south slope of Pike Hill and the discharge associated with the Smith Mine impacts a tributary to Cookville Brook. Both Pike Hill Brook and Cookville Brook are tributaries to the Waits River. The Waits River is a tributary of the Connecticut River.

The Eureka and Union Mine areas of the Pike Hill Mine Superfund Site are located in a broad but well-defined, moderately sloping valley which forms a major portion of the headwaters to Pike Hill Brook. The surface water flow from this area of the Pike Hill Mine Superfund Site was measured at a gauge with a range of flow between 0.01 and 2.5 cfs prior to entering Pike Hill Brook.

The impacts to Pike Hill Brook from the Union and Eureka mines at the Pike Hill Mine Superfund Site have been documented through several studies performed by the Vermont Agency of Natural Resources (VTANR), EPA and by the United States Geological Survey (USGS) working for EPA. The key finding of these studies are:

- The discharge from the Pike Hill Mine Superfund Site is causing acute toxicity (100% mortality) in surface water toxicity tests performed in surface water in the tributary from the Pike Hill Mine Superfund Site that drains into Pike Hill Brook and in Pike Hill Brook after the confluence with the discharge from the Pike Hill Mine Superfund Site.
- Copper concentrations in the water of the tributary to Pike Hill Brook and in Pike Hill Brook after the confluence with the discharge from the Pike Hill Mine Superfund Site exceed Vermont Water Quality numerical standards and federal Clean Water Act National Recommended Water Quality Criteria.
- The benthic community and fish community of Pike Hill Brook are severely impaired by

the release from the Pike Hill Superfund Site for several miles below the confluence of the water from the Pike Hill Mine Superfund Site with Pike Hill Brook.

Copper concentrations in surface water entering Pike Hill Brook from the Site range from 1,940 to 30,800 ppb. The range of pH measured in the tributary to Pike Hill Brook within the Pike Hill Superfund Site was between 2.7 and 4.4 standard units. The sediment in this same tributary downgradient of the waste rock piles has a copper concentration of 8,070 ppm. This is the same concentration as the waste rock and indicates that erosion has transported mine waste into Pike Hill Brook.

The Smith Mine area is located along the western flank of a narrow south-facing valley drained by a 1 mile long tributary to Cookville Brook. The headwater to this tributary is located upgradient of the Smith Mine area and does not appear to have any significant branches in the vicinity of the mine. This tributary passes within 500 ft of the mine waste rock piles and at least one significant seep has been identified along the bank of this tributary downslope of the Smith Mine. Stream flow of this tributary was estimated between 0.19 and 0.63 cfs during two observations by USGS. While the extent of the area impacted by the release from the Smith Mine area of the Pike Hill Mine Superfund Site is less extensive, the surface water in the tributary to Cookville Brook where the Smith Mine leachate discharges contains elevated levels of copper and has caused documented reductions in the benthic community.

III. Threat to Public Health, Welfare, or the Environment

Consistent with Section 300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the Agency considered the following factors in determining whether a removal action is appropriate for the Site, including:

(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants – The Site contains sulfidic mine waste that creates low pH leachate and which also contains elevated levels of metals toxic to aquatic organisms, particularly aluminum, copper and zinc. For the areas within the Site and immediately down gradient the low pH water and elevated metals are causing severe impacts to aquatic organisms as indicated by 100% mortality in surface water toxicity tests. The metals impacts extend downstream as evidenced by toxicity of the surface water that extends for a mile downstream of the Site.

(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems – The mine waste at the Site is causing contamination to sensitive ecosystems, including surface water bodies supporting federal and state threatened and endangered bats. The impacts to the surface water at the Site deplete the available prey for the threatened and endangered bats. Pike Hill Mine is a very unique hibernation site for bats in Vermont. It is colder and drier than many other hibernation sites and hosts the largest known concentration of state-threatened eastern small-footed bats in Vermont.

(iii) Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release – There are no drums, tanks or other bulk storage containers at the Site.

(iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate – High levels of hazardous pollutants or contaminants, particularly copper and zinc are largely at or near the surface in the mine waste piles and are actively migrating into the surface water of Pike Hill Brook creating contaminated surface water and sediment. These pollutants or contaminants are also migrating into downstream wetlands and contaminating these areas.

(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released – The exposed nature of the mine waste materials creates a situation where significant rain or snowmelt events will cause a release of contaminated MIW and sediments.

(vi) Threat of fire or explosion – There was a documented occurrence of a fire from spontaneous combustion of the sulfide mine waste. This could re-occur unless the waste material is contained.

(vii) The availability of other appropriate federal or state response mechanisms to respond to the release – Due to the potential high costs associated with the NTCRA, there are likely no State response mechanisms available with sufficient funding to perform a NTCRA to respond to the threats posed by the mine waste materials. PRP search activities are completed and no viable liable PRPs have been identified.

(viii) Other situations or factors that may pose threats to public health or welfare or the environment – The major threats are discussed above and relate to the release of low pH leachate with elevated metals concentrations severely degrading the biological communities in Pike Hill Brook and a tributary to Cookville Brook.

In addition to the Section 300.415(b)(2) factors discussed above, the Agency also considered the: (1) time-sensitivity of the response; (2) the complexity of both the problems to be addressed and the action to be taken; (3) the comprehensiveness of the proposed action and (4) the likely cost of the action to support initiation of a NCTRA at the Site.

If this response action is not implemented, the severe impacts to the aquatic biota of Pike Hill Brook will continue and additional mine waste will erode and be transported into Pike Hill Brook and the downstream wetlands. The adverse impact on the food chain caused by MIW reduces the availability of prey organisms for federal and state threatened and endangered bats.

The source control action under consideration would address the most significant source material at the Site and will be a component of the larger cleanup for the Site to be addressed through a future remedial action. It is anticipated, however, that beyond the source control action, the

remaining cleanup actions involving sediments, wetlands, underground mine workings and groundwater will require several years of additional field investigations (once funding is available) to address these components of the Site cleanup. Based on the experience gained in addressing all three of the Vermont copper mining sites, the Region expects the remedy for the Pike Hill Copper Mine Site would necessarily include the source control action (to be developed in the EE/CA) and if undertaken pursuant to a NTCRA can be accomplished considerably more quickly than it would take to develop the comprehensive Site remedy. This would similar and nature, but smaller in scope, as the source control actions taken at the other two Vermont mining sites suggesting that this cleanup approach is technically appropriate and not overly complex in scope supporting that it can be implemented as a NTCRA.

One or more of the 11 EJSCREEN application's EJ Indices is at or above the 80th percentile at the state average level, thus Region 1 considers this to be an Environmental Justice site.

The State of Vermont fully supports development of an EE/CA and an early action at this Site.

This removal is designated as non-time-critical because more than six months of planning time will be required prior to initiation of on-Site activities. Prior to the actual performance of a non-time critical removal at this Site, Section 300.415(b)(4) of the NCP requires that an EE/CA be performed in order to weigh different response options.

IV. Endangerment Determination

Actual or threatened releases of hazardous substances or pollutants or contaminants from this Site, if not addressed, may present an imminent and substantial endangerment to public health, welfare, or the environment. In accordance with Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA, OSWER Directive 9360.0-34 (August 19, 1993), an endangerment determination by an EPA risk assessor will be included in the EE/CA based on existing sampling data collected for the Site.

V. Scope of the EE/CA

The purpose of the EE/CA will be to evaluate alternatives for response measures to address the release of MIW from mine waste material. The EE/CA here benefits greatly from the Region's experience gained at the other two Vermont copper mining Sites.[1] The EE/CA will consider alternatives which meet the following general removal action objectives:

- Prevent, to the extent practicable, the release of MIW from the mine waste at the Site by isolating the waste material from water and oxygen.
- Prevent, to the extent practicable, the off-site transport of mine waste as a result of erosion and sediment transport processes.
- Implement the response action in a manner that will minimize, to the extent practical, impacts to federal and state threatened and endangered bats.
- Implement the response action in a manner that will minimize, to the extent practical, impacts to historic resources at the Site.

Pursuant to EPA guidance on EE/CAs, alternatives will be evaluated based upon effectiveness, implementability, cost and compliance with Applicable or Relevant and Appropriate Requirements (ARARs) to the extent practicable. The alternatives that will be proposed in the EE/CA range from in-situ stabilization of the mine waste or consolidation and containment on-site to off-site disposal of the mine waste material. Alternatives will also evaluate passive treatment technologies to reduce the toxicity of any residual mine drainage from the mine waste or the adits. It is estimated that any alternatives to address mine waste and adits will exceed $2 million dollars and therefore they will be evaluated to determine their consistency with future remedial actions to be taken at the Site.

In developing the range of alternatives to be evaluated in the EE/CA, EPA will, pursuant to Section 300.415(d) of the NCP, consider actions that shall, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action with respect to the releases concerned, as well as other relevant guidance.

VI. Enforcement Strategy

EPA has concluded that there are no viable, liable PRPs available to perform or contribute to the cleanup at this Site.

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[1] The three copper mine sites are substantially similarly with respect to minerology and operational history, but vary in terms of size. Elizabeth Mine, listed on the NPL in 2001 is the largest, containing several million cubic yards of mine waste. Ely Mine, also listed on the NPL in 2001, follows with about 200,000 cubic yards of waste mater. Cleanup at Elizabeth proceeded under a NTCRA to address the main source areas and this work has been recently completed. Similarly, the design for the cleanup at Ely Mine has been completed and is awaiting funding. As noted above, Pike Hill is the smallest of the three Sites.

VII. Estimated Costs

Costs associated with the preparation of the EE/CA(s) described above, including community relations activities and further development of an Administrative Record, are expected to be approximately $400,000. Based upon preliminary estimates, costs associated with containment of the mine waste and treatment of the MIW is estimated to be in the $15,000,000 range. This estimate will be fully developed during in the EE/CA.

The EE/CA for the proposed NTCRA at the Site will be performed by EPA as a fund lead response action. Therefore, federal funds for the performance of an EE/CA are requested at this time. As noted above in Section VI, EPA has completed the PRP search activities and no viable PRPs have been identified.

IX. Headquarters Consultation

In accordance with the national guidance document, Use of Non-Time-Critical Removal Authority in Superfund Response Actions dated February 14, 2000, EPA Region 1 has consulted with the Office of Superfund Remediation and Technology Innovation (OSRTI) based on the anticipated cost of the NTCRA being greater than $6 million. The Region received email concurrence to proceed with the Approval Memorandum on November 19, 2021.

X. Recommendation

Ongoing investigations have determined that there has been a release of hazardous substances to the environment. Additionally, conditions at the Site meet the NCP Section 300.415(b) criteria for a removal. Consistent with Section 104(b) of CERCLA and NCP Section 300.415(b)(4), further investigation is necessary to plan and direct the future removal action. We recommend your approval of this request to perform an EE/CA at the Pike Hill Mine Superfund Site. The total estimated cost incurred for performing the EE/CA is approximately $400,000.

Approved:

KAREN MCGUIRE Digitally signed by KAREN MCGUIRE
Date: 2021.12.01 17:22:07 -05'00'

Karen McGuire, Director
Enforcement and Compliance Assurance Division for
Bryan Olson, Director, Superfund and Emergency Management Division